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with angle)

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THES=ASSIGNEE; PLUR=YES; OP=OR*

L1 steer\$ near2 angle

28190 L1

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☐ 1. Document ID: US 6659570 B2

L6: Entry 1 of 9

File: USPT

Dec 9, 2003

US-PAT-NO: 6659570

DOCUMENT-IDENTIFIER: US 6659570 B2

TITLE: Vehicle motion control device and method

| Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KMNC | Draw D |
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|
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☐ 2. Document ID: US 6276766 B1

L6: Entry 2 of 9

File: USPT

Aug 21, 2001

US-PAT-NO: 6276766

DOCUMENT-IDENTIFIER: US 6276766 B1

TITLE: Brake system for behavior control of vehicle having pump to start on forecast of execution of control by a plurality of parameters

| Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KMNC | Draw D |
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|

☐ 3. Document ID: US 6053583 A

L6: Entry 3 of 9

File: USPT

Apr 25, 2000

US-PAT-NO: 6053583

DOCUMENT-IDENTIFIER: US 6053583 A

TITLE: Stability control system for vehicle

| Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KMNC | Draw D |
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|

☐ 4. Document ID: US 5973463 A

L6: Entry 4 of 9

File: USPT

Oct 26, 1999

US-PAT-NO: 5973463
DOCUMENT-IDENTIFIER: US 5973463 A

TITLE: Driving controller for electric vehicle

| Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D |
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|

☐ 5. Document ID: US 5863105 A

L6: Entry 5 of 9

File: USPT

Jan 26, 1999

US-PAT-NO: 5863105
DOCUMENT-IDENTIFIER: US 5863105 A

TITLE: Turn control apparatus for a motor vehicle equipped with antiskid braking system

| Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D |
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|

☐ 6. Document ID: US 5276624 A

L6: Entry 6 of 9

File: USPT

Jan 4, 1994

US-PAT-NO: 5276624
DOCUMENT-IDENTIFIER: US 5276624 A

TITLE: Turning control apparatus for vehicle

| Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D |
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|

☐ 7. Document ID: US 4951207 A

L6: Entry 7 of 9

File: USPT

Aug 21, 1990

US-PAT-NO: 4951207
DOCUMENT-IDENTIFIER: US 4951207 A

TITLE: Method for controlling the front wheel steer angle

| Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D |
|------|-------|----------|-------|--------|----------------|------|-----------|--|--|--------|------|--------|
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☐ 8. Document ID: US 4926955 A

L6: Entry 8 of 9

File: USPT

May 22, 1990

US-PAT-NO: 4926955
DOCUMENT-IDENTIFIER: US 4926955 A

** See image for Certificate of Correction **

TITLE: Rear wheel steering apparatus for automobile

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D |
|------|-------|----------|-------|--------|----------------|------|-----------|--------|------|--------|
|------|-------|----------|-------|--------|----------------|------|-----------|--------|------|--------|

9. Document ID: US 4669745 A

L6: Entry 9 of 9

File: USPT

Jun 2, 1987

US-PAT-NO: 4669745

DOCUMENT-IDENTIFIER: US 4669745 A

TITLE: Apparatus for controlling steering angle of rear wheels of a vehicle

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D |
|------|-------|----------|-------|--------|----------------|------|-----------|--------|------|--------|
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L6: Entry 1 of 9

File: USPT

Dec 9, 2003

US-PAT-NO: 6659570

DOCUMENT-IDENTIFIER: US 6659570 B2

TITLE: Vehicle motion control device and method

DATE-ISSUED: December 9, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|-----------------|------------|-------|----------|---------|
| Nakamura; Akira | Tagata-gun | | | JP |

US-CL-CURRENT: [303/146](#); [180/197](#), [303/112](#), [303/147](#), [701/74](#)

ABSTRACT:

Vehicle motion control devices and methods systematically treat a conditions of each wheel to acquire and maintain the vehicle behavior stability together with anti wheel lock and wheel spin processing, braking forces distribution. Device for controlling a running behavior of a vehicle estimates a road reaction force on each wheel, calculates a yaw moment around a centroid of the vehicle body generated by the road reaction force on each wheel, and controls driving and braking forces on each wheel based upon the yaw moments so as to stabilize a running of the vehicle. Spin and Drift conditions are detected through presently generated yaw moments and critical yaw moments which can be generated by a road reaction force assumed to be maximized. Physical parameters of each wheels, required for detecting and controlling the behavior of the vehicle are estimated with a theoretical tire model.

82 Claims, 49 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 30

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L6: Entry 2 of 9

File: USPT

Aug 21, 2001

US-PAT-NO: 6276766

DOCUMENT-IDENTIFIER: US 6276766 B1

TITLE: Brake system for behavior control of vehicle having pump to start on
forecast of execution of control by a plurality of parameters

DATE-ISSUED: August 21, 2001

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|-------------------|--------------|-------|----------|---------|
| Yamada; Yoshihisa | Shizuoka-ken | | | JP |

US-CL-CURRENT: 303/154; 303/113.2, 303/146

ABSTRACT:

A brake system of a vehicle for a vehicle behavior stabilizing control has a working fluid circuit including wheel cylinders, a pump to produce a raised pressure source of a working fluid without an accumulator, fluid flow control valves for selectively supplying the working fluid from the raised pressure source to each wheel cylinder for applying braking, and an automatic controller for controlling the pump and the fluid flow control valves, wherein the automatic controller starts to operate the pump when a first parameter suggestive of a first running condition of the vehicle increases across its threshold value and starts to operate the fluid flow control valves for the vehicle behavior stabilizing control when a second parameter suggestive of a second running condition of the vehicle increases across its threshold value.

8 Claims, 9 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 8

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L6: Entry 3 of 9

File: USPT

Apr 25, 2000

US-PAT-NO: 6053583

DOCUMENT-IDENTIFIER: US 6053583 A

TITLE: Stability control system for vehicle

DATE-ISSUED: April 25, 2000

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|--------------------|------------------|-------|----------|---------|
| Izumi; Tomoji | Hatsukaichi | | | JP |
| Okazaki; Haruki | Hiroshima | | | JP |
| Tsuyama; Toshiaki | Higashihiroshima | | | JP |
| Tachihata; Tetsuya | Hiroshima | | | JP |

US-CL-CURRENT: 303/150; 303/146, 701/91

ABSTRACT:

A system of driving stability control, which is adapted to control valves for opening and closing hydraulic pressure passages between a master cylinder and brake units of wheels and simultaneously controls pressurizing valves and a pressure relief valves so as to supply braking force selectively and independently to the brake units when a specified driving condition is detected, performs the coordinated braking control that, when a specified step-on pressure is detected during execution of the driving stability control, delivers the braking pressure to the brake units according to brake pedal travels as the driving intends simultaneously with reducing the participative degree of the driving stability control so as to ensure gripping force of wheels that brake the vehicle and reduces reduce the participative degree of the driving stability control with an intention of regarding driving stability of the vehicle as important when the vehicle is going to cause a spin.

12 Claims, 7 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 7

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File: USPT

Oct 26, 1999

US-PAT-NO: 5973463

DOCUMENT-IDENTIFIER: US 5973463 A

TITLE: Driving controller for electric vehicle

DATE-ISSUED: October 26, 1999

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|-----------------|-----------|-------|----------|---------|
| Okuda; Kenzo | Toyota | | | JP |
| Mizutani; Ryoji | Aichi-ken | | | JP |

US-CL-CURRENT: 318/430; 180/282, 318/432, 318/67, 701/4

ABSTRACT:

A driving controller of electric vehicles. An angular accelerative dimension error calculator calculates error information having a dimension of angular acceleration of a car body. A feedback torque calculator calculates the feedback torque on the basis of the error information according to the sign of a steering angle and the error information, and ON/OFF of an accelerator. A vehicle controller corrects the reference torque, determined according to an accelerator angle and braking force, by the feedback torque, and outputs the corrected reference torque toward motor controllers, thereby improving vehicle running safety.

4 Claims, 16 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 12

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L6: Entry 5 of 9

File: USPT

Jan 26, 1999

US-PAT-NO: 5863105

DOCUMENT-IDENTIFIER: US 5863105 A

TITLE: Turn control apparatus for a motor vehicle equipped with antiskid braking system

DATE-ISSUED: January 26, 1999

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|----------------|---------|-------|----------|---------|
| Sano; Yoshiaki | Okazaki | | | JP |

US-CL-CURRENT: 303/146; 303/140

ABSTRACT:

A turn control apparatus for a motor vehicle comprises an arithmetic operation section for acquiring a correction amount for the target slip ratio of a target wheel to be controlled based on the required yaw moment of the vehicle in a situation where an antiskid braking system (ABS) should be activated, a computing section for computing the target slip ratio upon reception of the correction amount from the arithmetic operation section, and a section for acquiring actuation modes and pulse widths for inlet and outlet valves for wheel brakes of the individual wheels, based on the target slip ratio when the ABS is in operation.

10 Claims, 58 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 49

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File: USPT

Jan 4, 1994

US-PAT-NO: 5276624

DOCUMENT-IDENTIFIER: US 5276624 A

TITLE: Turning control apparatus for vehicle

DATE-ISSUED: January 4, 1994

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|----------------------|----------|-------|----------|---------|
| Ito; Masayoshi | Okazaki | | | JP |
| Yamada; Kiichi | Nagoya | | | JP |
| Yoshida; Hiroaki | Okazaki | | | JP |
| Otake; Katsunori | Nagoya | | | JP |
| Miyata; Yasunobu | Komaki | | | JP |
| Hashiguchi; Masayuki | Obu | | | JP |
| Tani; Masanori | Okazaki | | | JP |
| Isoda; Keiji | Nagoya | | | JP |
| Shigehara; Toshio | Okazaki | | | JP |
| Yuasa; Hiroo | Nagoya | | | JP |
| Tanaka; Tadao | Okazaki | | | JP |
| Osaki; Masayoshi | Okazaki | | | JP |
| Yoshida; Hiroshi | Toyokawa | | | JP |

US-CL-CURRENT: 701/72; 180/282, 701/70

ABSTRACT:

In a turning control apparatus for a vehicle, a torque calculation unit calculates a target lateral acceleration of the vehicle according to detection signals from a steering angle sensor for detecting the direction of a steering wheel and a vehicle speed sensor for detecting the speed of the vehicle. It then sets target driving torque of the engine according to the target lateral acceleration. An electronic control unit controls the operation of a torque control device for reducing driving of the engine so that the driving torque of the engine is a target driving torque independent of manipulation by the driver. This thereby rapidly estimates lateral acceleration applied to the vehicle during turning and prevents control delay to enable stable and positive traveling through a curved road.

36 Claims, 59 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 43

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File: USPT

Aug 21, 1990

US-PAT-NO: 4951207

DOCUMENT-IDENTIFIER: US 4951207 A

TITLE: Method for controlling the front wheel steer angle.

DATE-ISSUED: August 21, 1990

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|--------------------|---------|-------|----------|---------|
| Furukawa; Yoshimi | Saitama | | | JP |
| Takei; Akihiko | Saitama | | | JP |
| Ishida; Shinnosuke | Saitama | | | JP |
| Oono; Nobuyuki | Saitama | | | JP |

US-CL-CURRENT: 701/42; 180/446

ABSTRACT:

The method of the present invention improves the damping property of the yaw motion of the vehicle by feeding back a detected yaw rate value in a dynamic sense for compensating the front wheel steer angle so as to increase the damping coefficient of the yaw motion of the vehicle. By controlling the front wheel steer angle by accounting for not only the proportional term of the steering wheel input angle but also the derivative term which is proportional to the steering wheel input angular speed, in the feed-forward control of the front wheel steer angle in relation with the steering operation by the driver, and by appropriately varying the control parameters of the yaw rate feed-back and the steering wheel input feed-forward, the yaw response of the vehicle can be made proportional to the steering wheel input, and the response delay in the yaw rate against the steering wheel input can be reduced to substantially zero.

12 Claims, 8 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 3

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File: USPT

May 22, 1990

US-PAT-NO: 4926955

DOCUMENT-IDENTIFIER: US 4926955 A

**** See image for Certificate of Correction ****

TITLE: Rear wheel steering apparatus for automobile

DATE-ISSUED: May 22, 1990

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|--------------------|------------------|-------|----------|---------|
| Ohmura; Hiroshi | Higashihiroshima | | | JP |
| Nakashima; Takashi | Hiroshima | | | JP |

US-CL-CURRENT: 180/414; 701/20, 701/43

ABSTRACT:

A rear wheel steering apparatus for an automobile detects a vehicle speed and turns rear wheels at a rear wheel turning angle ratio according to the detected vehicle speed upon turning of front wheels. The apparatus includes a vehicle speed detection section for detecting a vehicle speed, a setting section for setting a rear wheel turning angle ratio in accordance with the vehicle speed detected by the vehicle speed detection section, a travel detection section detecting a travel state of a vehicle, a change section for changing turning angle ratio control by the setting section to fail-safe control when a detection output from the vehicle speed detection section is zero and the travel detection section detects the travel state of the vehicle, a brake detection section for detecting a brake operation state, and an inhibition section for inhibiting a change from the normal turning angle ratio control to the fail-safe control by the change section when the brake detection section detects a brake operation state.

24 Claims, 12 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 10

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File: USPT

Jun 2, 1987

US-PAT-NO: 4669745

DOCUMENT-IDENTIFIER: US 4669745 A

TITLE: Apparatus for controlling steering angle of rear wheels of a vehicle

DATE-ISSUED: June 2, 1987

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|-------------------|--------|-------|----------|---------|
| Miki; Kazuo | Aichi | | | JP |
| Fukui; Katsuhiko | Nagoya | | | JP |
| Hayashi; Yasutaka | Seto | | | JP |
| Ishiguro; Michio | Toyota | | | JP |
| Sumi; Kazumasa | Nagoya | | | JP |
| Takei; Kazukata | Toyota | | | JP |

US-CL-CURRENT: 180/410

ABSTRACT:

An apparatus for controlling steer angle of rear wheels of a 4-wheel steering vehicle in accordance with the operation of a steering wheel for generating steer angle of front wheels. The apparatus comprises a first member which moves in response to the operation of the steering wheel; a second member which moves in response to the operation of the steering wheel in a direction counter to that of the first member; an output shaft for controlling the steer of the rear wheels; a resilient member disposed between the first member and the output shaft and a controller disposed between the second member and the output shaft for controlling the direction of movement of the output shaft in accordance with the speed of operation of the steering wheel. When the steering wheel is operated at high speed, the resilient member absorbs the force from the first member so that the output shaft moves in the same direction as the second member, whereby the rear wheels are turned in a direction counter to that of the front wheels. When the steering wheel is operated at low speed, the force from the second member is damped so that the output shaft moves in the same direction as the first member, whereby the rear wheels are turned in the same direction as the front wheels.

24 Claims, 49 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 32

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